4.6 Geology and Soils

This section of the EIR describes the potential physical environmental effects related to the issues of geology and soils resulting from implementation of the Master Plans.

As discussed in Chapter 4, Environmental Analysis, the following CIP projects have been adequately addressed in previous CEQA documents and are not included in this analysis: Sewer CIP Projects SR-6, SR-10, SR-25, N-1, N-2, N-5, N-7, N-8, N-10, N-11, I-3, I-4, I-5, and I-6; Water CIP Projects 7, 8, 40, and R6; and Recycled Water CIP Project ES3.

4.6.1 Environmental Setting

4.6.1.1 Geology

Carlsbad is situated in the coastal foothill section of the Peninsular Ranges Geomorphic Province. The Peninsular Ranges Province extends to the southern tip of Baja California and is bound to the east by the Colorado Desert and to the north by the Transverse Range and varies in width from approximately 30 to 100 miles. The province is characterized by a series of roughly northwest trending ranges separated by longitudinal valleys trending sub-parallel to faults associated with the San Andreas Fault complex. In general, the Peninsular Ranges Province consists of rugged mountains dominated by Mesozoic granitic rocks derived from the massive Southern California batholith as well as exposures of Jurassic metavolcanic and metasedimentary rocks, and Cretaceous igneous materials (California Geological Survey 2006).

4.6.1.2 Faults

An *active* seismic source is defined as a fault that has ruptured within the last 35,000 years. The 35,000 years interval value was selected based on the belief that the Holocene activity is not a sufficient conservative criterion for elimination of a fault when estimating ground movement and essentially defines a level of risk for a particular area (Fraser 2001). A *conditionally* active fault is Quaternary active, but its displacement history during the last 35,000 years is not known well enough to determine activity or inactivity (Fraser 2001). Faults that have no suggestion of Quaternary activity are generally presumed to be *inactive.* Faults exhibit a wide range of average recurrence intervals from a few decades to over several hundreds of thousands of years. A fault that has not moved in the last 35,000 years is assumed to have a ground rupture recurrence interval of greater than 35,000 years.

Table 4.6-1 identifies active faults located within approximately 60 miles of the project area, measured from the location of the Palomar Community College, San Marcos Campus. The approximate locations of the faults are shown in Figure 4.6-1. Movement on any of these faults may generate seismically induced groundshaking and surface rupture. Groundshaking can cover a wide area relative to the distance from the fault movement. Fault movement may result in a variety of seismic hazards, which are discussed below under Section 4.6.1.3.

Magnitude Scales

The Richter scale was developed in 1935 by Charles Richter for use in a study area in California to measure the strength of an earthquake (Hough 2007). The more commonly used scale today is the moment magnitude (Mw) scale, developed by the U.S. Geological Service (USGS) in 1978, which is a measure of the potential energy released on a fault expressed in whole numbers and decimals (e.g. 4.2) (Utsu et al. 2002). The Mw of an earthquake is defined relative to the seismic moment for an earthquake event. The magnitude of each earthquake varies with the recorded seismic moment. Each whole number increase in magnitude of an earthquake event represents an increase in amplitude of ten times and the energy release by approximately 31 times. The moment magnitude for active faults within 60 miles of the service areas is shown in Table 4.6-1.

Table 4.6-1 Active Faults within 60 miles of the Service Areas [1]

Fault	Moment Magnitude (Mw) [2]	Slip Rate (mm/yr) [3]	Fault Type	Fault Movement [2]	Approximate Distance (miles)
Rose Canyon	7.2	1.5	B	SS-RL	12
Newport-Inglewood (Offshore)	7.1	1.5	B	SS-RKL	14
Elsinore (Julian Segment)	7.1	5.0	A	SS-RL	18
Elsinore (Temecula Segment)	6.8	5.0	A	SS-RL	19
Coronado Bank	7.6	3.0	B	SS-RL	27
Earthquake Valley	6.5	2.0	B	SS-RL	35
Elsinore (Glen Ivy Segment)	6.8	5.0	A	SS-RL	35
San Jacinto (Anza Segment)	7.2	12.0	A	SS-RL	41
San Joaquin Hills	6.6	0.5	B	DS-R (23 SW)	42
San Jacinto (San Jacinto Valley Segment)	6.9	12.0	A	SS-RL	43
San Jacinto (Coyote Creek Segment)	6.8	4.0	A	SS-RL	44
Palos Verde	7.3	3.0	B	SS-RL	45
Elsinore (Coyote Mountain Segment)	6.8	4.0	A	SS-RL	49
Chino Central Avenue (Elsinore Segment)	6.7	1.0	B	RL-R-O (65 SW)	52
Newport-Inglewood (L.A. Basin)	7.1	1.0	B	SS-RL	53
Whittier	6.8	2.5	A	RL-R-O (75NE)	55
San Jacinto (Borrego Segment)	6.6	4.0	A	SS-RL	58
San Jacinto (San Bernardino Segment)	6.7	12.0	A	SS-RL	60

(1) Measurements in this table were taken from the Palomar Community College, San Marcos campus, located in the southeastern portion of the service areas.
(2) See text for definitions and explanations
(3) mm/yr = millimeters per year

Fault Types

The California Department of Conservation, Division of Mines and Geology (CDMG) classify active surface faults into one of the following three categories:

- **Type A.** Faults that exhibit a moment magnitude of 7.0 or greater, and have a slip rate of at least 5 mm/yr.

- **Type B.** Faults that exhibit a moment magnitude of 6.5 to 7.0, and have slip rates that vary depending on magnitude.
- **Type C**. All other faults not classified as type A or B.

The above listed classification of faults into types A, B, and C is based on the potential energy released along a fault during displacement of the earth's crust in the form of earthquakes and in some cases, seismic creep. The classification type for active faults within 60 miles of the service areas is shown in Table 4.6-1. The potential energy released along a fault is determined by four factors: the slip rate, the area (fault length multiplied by down-dip width), maximum magnitude, and the rigidity of the displaced rocks. These factors in combination are used to calculate the movement magnitude.

Fault Movement

Table 4.6-1 also identifies three types of differential movement of faults within 60 miles of the service areas:

- **Strike-Slip Faults (SS).** During strike-slip faulting, the sides of the fault move laterally relative to each other. These faults are predominantly described as right-lateral (RL) or left-lateral (LL).
- **Dip-Slip Faults (DS).** During dip-slip faulting, one side of the fault moves up or down relative to the other side. These faults are predominantly described as normal (N) or reverse (R).
- **Oblique-Slip Faults** (O). Oblique-slip faults have characteristics of both a strike-slip fault and dip-slip fault.

4.6.1.3 Seismic Hazards

Earthquake-related geologic hazards pose a significant threat to areas within San Diego County and can impact extensive regions of land. Earthquakes can produce fault rupture and strong groundshaking, and can trigger landslides, rockfalls, soil liquefaction, tsunamis, and seiches. In turn, these geologic hazards can lead to other hazards such as fires, dam failures, and toxic chemical releases among others (County 2009; Fraser 2001).

Primary effects of earthquakes include violent ground motion, and sometimes permanent displacement of land associated with surface rupture. Earthquakes can snap and uproot trees, or throw people to the ground. They can also shear or collapse large buildings, bridges, dams, tunnels, pipelines, and other rigid structures, as well as damage transportation systems, such as highways, railroads, and airports. Secondary effects of earthquakes include near-term phenomena such as liquefaction, landslides, fires, tsunamis, seiches, and floods. Long-term effects associated with earthquakes include phenomena such as regional subsidence or emergency of landmasses and regional changes in groundwater levels (County 2009).

Fault Rupture

During earthquakes, the ground can rupture at or below the surface. Ground rupture occurs when two lithospheric pieces heave past each other, sending waves of motion across the earth. Earthquakes can cause large vertical and/or horizontal displacement of the ground along the fault. Ground rupture can complete demolish structures by rupturing foundations and/or by tilting foundation slabs and walls, as well as damage buried and above-ground utilities. Drinking water can be adversely affected and the loss of water lines or water pressure can affect emergency services, including fire fighting ability. Research of historical earthquakes have shown that , although only a few structures have been ripped apart by fault rupture, this hazard can produce severed damage to structures built across active fault lines.

Groundshaking

Groundshaking is the most common effect of earthquakes that adversely affects people, animals, and construction improvements, and produces the vast majority of damage. Several factors control how ground motion interacts with structures, making the hazard of groundshaking difficult to predict. Earthquakes, or earthquake induced landslides, can cause damage near and far from the fault lines. The potential damage to public and private buildings and infrastructure can threaten public safety and result in significant economic loss. The CBC defines different Seismic Design Categories based on building occupancy type and the severity of the probable earthquake ground motion at the site. There are six Seismic Design Categories and are designated as Categories A through F, with Category A having the least seismic potential and Category F having the highest seismic potential. All of San Diego County is located within Seismic Design Categories E and F (County 2009).

Liquefaction

Liquefaction occurs primarily in saturated, loose, fine- to medium-grained soils in areas where the groundwater table is generally 50 feet or less below the surface. When these sediments are shaken during an earthquake, a sudden increase in pore water pressure caused the soils to lose strength and behave as if it was a liquid. In general, three types of lateral ground displacement are generated from liquefaction: 1) flow failure, which generally occurs on steeper slopes; 2) lateral spread, which generally occurs on gentle slopes; and 3) ground oscillation, which occurs on relatively flat ground. In addition, surface improvements on liquefiable areas may be prone to settlement and related damage in the event of a large earthquake on a regionally active fault. The primary factors that control the type of failure that is induced by liquefaction (if any) include slope, and the density, continuity, and depth of the liquefiable layer.

Landslides

A landslide is the sudden down slope movement of soil and/or rock. Landslides can range in speed from very rapid to an imperceptible slow creep. They can be caused by groundshaking from an earthquake or water from rainfall, septic systems, landscaping, or other origins that infiltrate slopes with unstable material. Boulder-strewn hillsides can pose a boulder-rolling hazard from groundshaking, blasting or gradual loosening of their contact with the surface. The likelihood of a landslide depends on an area's geological formations, topography, groundshaking potential, and influences of man. Improper use of excessive grading can increase the probability of a landslide. Land alterations such as excavation, filling, removing of vegetative cover, and introducing the concentration of water from drainage, irrigation, or septic systems may contribute to the instability of a slope and increase the likelihood of a landslide. Undercutting support at the base of a slope, or adding too much weight to the slope, can also produce a landslide.

Subsidence

Subsidence refers to elevation changes of the land, which can occur either gradually or suddenly. Subsidence can be caused by groundwater depletion, seismic activity, and other factors, and can cause a variety of problems including broken utility lines, blocked drainages, or distorted property boundaries and survey lines.

Expansive Soils

Certain types of clay soils expand when they are saturated and shrink when dried. These are called expansive soils (aka swelling soils) and can pose a threat to the integrity of structures build on them without proper engineering. Expansive soils primarily consist of montmorillonite and bentonite which are clays derived primarily from weathering of feldspar minerals and volcanic ash (Papke 1970). The expansion and contraction of the soil varies with the soil moisture content (wet or dry), and can be aggravated by the way a property is maintained or irrigated. Human activities can increase the moisture content of the soils, and the threat of expansive soil damage. For example, a subdivision of homes that continually irrigates the landscaping or removes significant amounts of native vegetation could create this condition (County 2009).

Seiches and Tsunami

A seiche is a standing wave on a completely or partially enclosed body of water. A seiche can occur from seismic groundshaking or by the sudden movement of a landslide into a lake or reservoir and could result in localized flooding or damage to low lying areas adjacent to large bodies of water. The size of a seiche and affected inundation area is depended of different factors including size and depth of the water body, elevation, type of shore, source, and if man made, the structural condition of the body of water in which the seiche occurs. A tsunami is a series of large waves in the open ocean that are caused by a sudden disturbance that displaces large amount of water. The impacts on coastline can be similar to those of a seiche, but can be much more devastating, causing loss of life and extensive property damage. The most common triggers for a tsunami include earthquakes, submarine landslides, and volcanic eruptions (County 2009).

4.6.2 Regulatory Framework

4.6.2.1 Federal

U.S. Geological Survey Landslide Hazard Program

In fulfillment of the requirements of Public Law 106-113, the USGS created the Landslide Hazard Program in the mid-1970s. The primary objective of the program is to reduce long-term losses from landslide hazards by improving our understanding of the causes of ground failure and suggesting mitigation strategies. The federal government takes the lead role in funding and conducting this research, whereas the reduction of losses due to geologic hazards is primarily a state and local responsibility. In San Diego County, the Unified Disaster Council is the governing body of the Unified San Diego County Emergency Services Organization. The primary purpose of the Council and the Emergency Services Organization is to provide for the coordination of plans and programs designed for the protection of life and property in San Diego County.

4.6.2.2 State

California Building Code

The CBC provides a minimum standard for building design. Chapter 16 of the 2010 CBC contains specific requirements for seismic safety. Chapter 18 of the 2010 CBC regulates excavation, foundations, and retaining walls. Chapter 33 of the 2010 CBC contains specific requirements pertaining to site demolition, excavation, and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction materials. Appendix Sections J109 and J110 of the 2010 CBC regulate grading activities, including drainage and erosion control. Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in California Occupation Safely and Health Administration regulations (Title 8 of the California Code of Regulations) and in Appendix Sections J106 and J1076 of the 2010 CBC.

California Alquist-Priolo (AP) Earthquake Fault Zoning Act (PRC Sections 2621-2630)

The California Legislature passed this law in 1972 for the purpose of prohibiting the development of human-occupied structures within known active fault areas, and to thereby mitigate the hazards associated with a possible earthquake fault rupture.

California Seismic Hazards Mapping Act (PRC Sections 2690-2699.6)

The California Geologic Survey, formerly the CDMG, provides guidance with regard to seismic hazards. Under CDMG's Seismic Hazards Mapping Act (1990), seismic hazard zones are identified and mapped to assist local governments in land use planning. The intent of this publication is to protect the public from the effects of strong groundshaking, liquefaction, landslides, ground failure, or other hazards caused as a result of earthquakes. In addition, CDMG's Special Publications 117, "Guidelines for Evaluating and Mitigating Seismic Hazards in California," provides guidance for the evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations.

National Pollution Discharge Elimination System Permits

In California, the State Water Resources Control Board and its Regional Water Quality Control Board administer the National Pollution Discharge Elimination System (NPDES) program. The NPDES permit system was established a part of the Federal Clean Water Act to regulate both point source discharges and non-point source discharges to surface water of the U.S., including the discharge of soils eroded from construction sites. The NPDES program consists of characterizing receiving water quality, identifying harmful constituents (including siltation), targeting potential sources of pollutants (including excavation and grading operations), and implementing a comprehensive storm water management program. Construction and industrial activities typically are regulated under statewide general permits that are issued by the State Water Resources Control Board. Additionally, the State Water Resources Control Board issues Water Discharge Requirements that also serve as NPDES permits under the authority delegated to the Regional Water Quality Control Boards, under the Clean Water Act.

4.6.2.3 Local

City of Carlsbad Municipal Code

Chapter 15 of the Carlsbad Municipal Code 15.16.10 established minimum requirements for grading, including the clearing and grubbing of vegetation and provides for the issuance of ministerial permits and to provide for the enforcement of the requirement.

City of Vista Municipal Code

Chapter 15 of the of Vista Municipal Code 15.04.010 implements CEQA and CEQA guidelines for the city by applying the provisions and procedures contained in CEQA to development projects proposed within Vista.

City of Oceanside Municipal Code

Chapter 36B (Section 40.1.4) of the Oceanside Municipal Code establishes minimum requirements for runoff and discharge control. The requirements reduce adverse effects of polluted runoff discharges, to secure the benefits from the use of runoff as a resource, and to ensure compliance with appropriate state and federal laws.

City of San Marcos Municipal Code

Chapter 18 subsection 18.04 of the San Marcos Municipal Code provides for the enhancement and protection of the environment by establishing principles, objectives, criteria, definitions and procedures for evaluating environmental impacts of public and private projects in an orderly manner. This chapter implements CEQA and the CEQA guidelines.

4.6.3 Project Impacts and Mitigation

4.6.3.1 Issue 1: Exposure to Seismic and Geologic Hazards

Geology and Soils Issue 1 Summary

Would implementation of the Sewer, Water, and Recycled Water Master Plans expose people or structures to potential substantial adverse effects of a known earthquake fault, strong seismic groundshaking, liquefaction, landslides, expansive or otherwise unstable soils?

Impact: The proposed CIP facilities would not expose people or structures to damage from earthquakes, seismic groundshaking, liquefaction, lateral spreading, subsidence, expansive soils, and/or landslides.	**Mitigation:** No mitigation required.
Significance Before Mitigation: Less than significant.	**Significance After Mitigation:** Impacts would be less than significant without mitigation.

Standards of Significance

Based on Appendix G of the CEQA Guidelines, implementation of the Master Plans would have a significant impact if people or CMWD facilities would be exposed to the substantial risk of loss, injury, or death as a result of rupture of a known earthquake fault, as delineated on the most recent AP Earthquake Fault Zoning Map issued by the state geologist for the area, or based on other substantial evidence of a known fault; strong seismic groundshaking; seismic-related ground failure; liquefaction; landslides; or expansive soils.

Impact Analysis

Fault Rupture and Groundshaking

The AP Earthquake Fault Zoning Act identifies areas that are subject to fault rupture. None of the proposed CIP facilities involve human habitation; therefore, the AP Earthquake Fault Zoning Act is not applicable to the Master Plans. Further, active faults in the region that could result in fault rupture include segments of the San Jacinto, Elsinore, and Rose Canyon. These faults are not located within the

CMWD service area. Therefore, the CIP projects proposed within the Master Plans would not be subject to a significant risk of fault rupture.

Groundshaking is the most common effect of earthquakes that adversely affects people and structures. San Diego County has a high seismic potential (County 2009). Therefore, proposed CIP projects may be subject to the adverse effects of seismic groundshaking. Although the Master Plans do not propose any facilities involving human habitation, seismic groundshaking has the potential to result in significance structural damage or facility failure. Structural damage or facility failure of a reservoir, pipeline, pump station or lift station could result in flooding, loss of potable drinking water and/or sewage spills. Due to the high seismic potential of the entire county, groundshaking risks cannot be entirely eliminated. However, the City and CMWD would be required to implement the relevant requirements of the 2010 CBC, as updated or amended, and CDMG's Special Publications 117, which would reduce groundshaking impacts to the extent feasible. Additionally, as described in Section 2.6.2, Project Design Features, a site-specific geotechnical investigation will be completed during the engineering and design of each CIP project that would require excavation in previously undisturbed soil, which would identify and make recommendations for any site-specific hazards. Therefore, potential impacts related to groundshaking would be less than significant.

Liquefaction, Landslides, and Expansive Soils

Liquefaction is not known to have occurred historically in San Diego County. However, the potential exists for liquefaction to occur in areas with loose sandy soils combined with a shallow groundwater table, which typically are located in alluvial river valleys/basins and floodplains (County 2009). Additionally, certain lands within the service areas are subject to landslides. Generally, landslide potential is considered high for areas that contain slopes of 15 percent or greater. The potential for expansive soils also exists in the service areas. Figure 4.6-2, Geohazards, depicts the CIP projects that generally have a high potential for liquefaction, landslides, and expansive soils based on regional soil data. As described in Section 2.6.2, Project Design Features, a site specific geotechnical investigation would be completed during the engineering and design of each CIP project that would require excavation in previously undisturbed soil that would identify and make recommendations for any site-specific hazards, including liquefaction, landslides, and expansive soils. The recommendations would be incorporated into the construction specifications for the CIP project. Therefore, potential impacts related to liquefaction, landslides, and expansive soils would be less than significant.

Mitigation Measures

Impacts related to seismic and geologic hazards would be less than significant. No mitigation is required.

Significance After Mitigation

Impacts related to seismic and geologic hazards would be less than significant without mitigation.

4.6.3.2 Issue 2: Soil Erosion or Top Soil Loss

Geology and Soils Issue 2 Summary

Would implementation of the Sewer, Water, and Recycled Water Master Plans result in substantial soil erosion or the loss of topsoil?

Impact: Construction of the proposed CIP projects within the Master Plans would not result in soil erosion or loss of topsoil.	**Mitigation:** No mitigation required.
Significance Before Mitigation: Less than significant.	**Significance After Mitigation:** Impacts would be less than significant without mitigation.

Standards of Significance

Based on Appendix G of the CEQA Guidelines, implementation of the Master Plans would have a significant impact if CIP construction projects would result in substantial soil erosion or loss of topsoil.

Impact Analysis

Earth-disturbing activities associated with the construction of CIP facilities would expose soils that could be subject to erosion during rain and wind events. Grading, excavation, on-site soils balancing and soil stockpiling operations would have the potential to expose soils to wind erosion and substantial erosion of topsoil during a rain event. Soil removal associated with grading and excavation activities would reduce soil cohesion, which could accelerate erosion. However, as discussed in Section 4.9.3.1, Water Quality, construction of the proposed CIP projects would be subject to the Storm Water General Permit or General Linear Utility Permit requirements to protect water quality during construction, particularly from eroded sediment. In addition, construction would be subject to requirements established by the cities of Carlsbad, Oceanside, Vista, or San Marcos, depending on project location. Compliance with the Storm Water General Permit, General Linear Utility Permit, and/or local development standards, including the preparation of a storm water pollution prevention plan (SWPPP) and/or implementation of applicable best management practices (BMPs), would reduce the potential increase in erosion associated with construction activities to a less than significant level.

Upon completion of construction of a proposed CIP facility, no exposed soils would remain on site that would be susceptible to the effects of wind erosion. For the projects constructed in undeveloped areas an increase in impermeable surfaces could occur. However, all CIP projects would comply with the requirements of the local Municipal Separate Storm Sewer Systems permit requirements regarding storm water discharge, which require no net increase in storm water runoff when compared to existing conditions. Compliance with the applicable permit requirements would result in less than significant impacts related to topsoil loss or increased erosion from CIP operational activities.

Mitigation Measures

Impacts related to soil erosion and topsoil loss would be less than significant. No mitigation is required.

Significance After Mitigation

Impacts related to soil erosion and topsoil loss would be less than significant without mitigation.

4.6.3.3 Issue 3: Septic Systems

Geology and Soils Issue 3 Summary

Would implementation of the Sewer, Water, and Recycled Water Master Plans require wastewater disposal in an area with soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for disposal of waste water?

Impact: Implementation of the proposed CIP projects would not require the use of septic systems.	**Mitigation:** No mitigation is required.
Significance Before Mitigation: Less than significant.	**Significance After Mitigation:** Impacts would be less than significant without mitigation.

Standards of Significance

Based on Appendix G of the CEQA Guidelines, implementation of the Master Plans would have a significant impact if they would require wastewater disposal in an area with soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for disposal of waste water.

Impact Analysis

The Master Plans propose new infrastructure and would not involve the use of septic tanks or and other alterative wastewater disposal systems. Implementation of the Sewer Master Plan would improve existing sewer service. No impact would occur.

Mitigation Measure

Impacts related to septic systems would be less than significant. No mitigation is required.

Significance After Mitigation

Impacts related to septic systems would be less than significant without mitigation.

4.6.4 Cumulative Impacts

Geology and Soils Cumulative Issue Summary

Would implementation of the proposed project have a cumulatively considerable contribution to a cumulative geology and soils impact considering past, present, and probable future projects?

Cumulative Impact	Significant?	Project Contribution
Exposure to seismic and geologic hazards.	No	Not cumulatively considerable.
Localized soil erosion or loss or loss of topsoil affected watersheds due to development.	Yes	Not cumulatively considerable.
Septic systems.	No	Not cumulatively considerable.

4.6.4.1 Exposure to Seismic and Geologic Hazards

Local events such as ground shaking, fault rupture, ground failure, subsidence, lateral spreading, liquefaction, and landslides can be directly caused by wide-spread seismic events they are not considered to be cumulative. Likewise, exposure to expansive soils is site specific and not cumulative in nature. The location of one cumulative project in a seismic or geologic potential hazard area would not have an effect on potential hazards to a cumulative project at another location. The amount of damage caused by each of these events would be very site-specific due to a various factors such as the type of base rock and soils each of the sites are located on. Also due to the narrow focus of most seismic events, the amount of stress given to the various areas will vary from place to place. As a result, the amount of damage caused by a seismic or geologic event will vary between locations. Therefore, the Master Plans, in combination with other cumulative projects, would not result in a cumulatively significant increase in exposure to seismic and geologic hazards.

4.6.4.2 Soil Erosion or Topsoil Loss

The geographic context for the analysis of cumulative impacts relative to soil erosion encompasses the Carlsbad and San Luis Rey watersheds directly downstream from the proposed CIP construction sites. This is because rainfall erosion of soils exposed by land disturbance activities can lead to downstream sedimentation effects, as sediment-laden runoff is carried along drainage facilities and natural water courses by storm water flows. Land disturbance activities may include agricultural practices, livestock grazing, and land development (e.g., vegetation clearing, grading, excavation, trenching) and these activities are expected to continue in the vicinity of the Carlsbad and San Luis Rey watersheds. Even with the promulgation of storm water regulations, land disturbance associated with development activities throughout these watersheds continues to contribute, however incrementally, to the overall sedimentation problems observed in runoff flows that discharge into watercourses, lagoons, and eventually the Pacific Ocean. Therefore, the baseline cumulative impact to the Carlsbad and San Luis Rey watersheds (i.e., local cumulative impact areas) caused by downstream sedimentation effects from soil erosion associated with basin-wide land disturbance activities is significant.

As described in Section 4.6.3.2 above, construction and operational activities associated with proposed CIP projects could result in soil erosion or loss of topsoil. Compliance with the Storm Water General

Permit, General Linear Utility Permit, and/or local development standards during construction, and the local Municipal Separate Storm Sewer Systems permit requirements during operation, would reduce impacts to a level below significance. Therefore, the Master Plans would not result in a cumulatively considerable contribution to downstream sedimentation effects from soil erosion within the local cumulative impact areas.

4.6.4.3 Septic Systems

Impacts related to septic systems are site specific and not cumulative in nature. The location of one project in an area not served by a sewer district would not affect whether another proposed project would be located within a sewer service district. Additionally, the sewer, water, and recycled water service areas and surrounding area are provided sewer service by the City of Carlsbad, Leucadia Wastewater District, and the Vallecitos Water District. Therefore, the Master Plans, in combination with other cumulative projects, would not result in a cumulatively significant impact related to septic systems.

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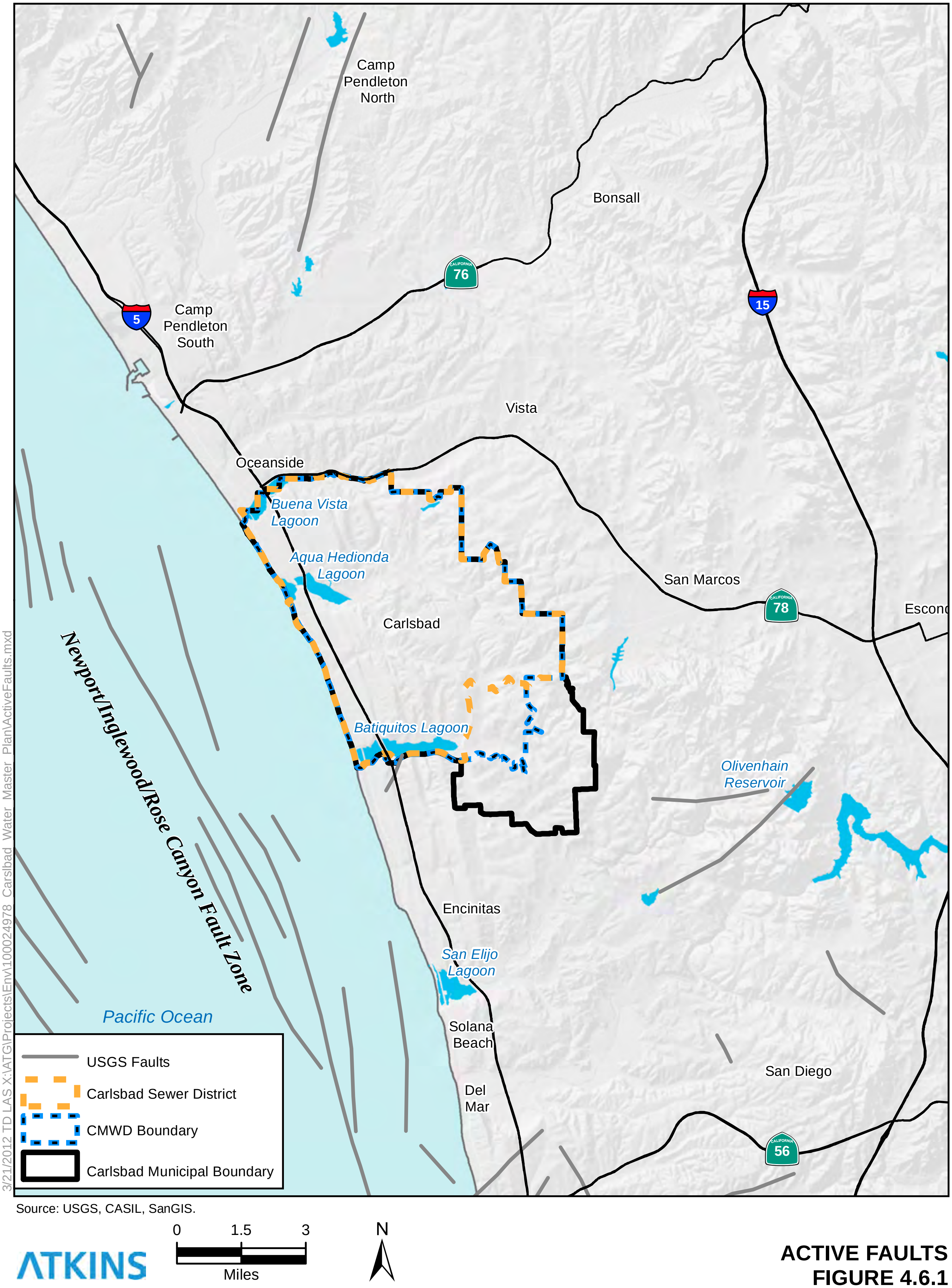

Source: USGS, CASIL, SanGIS.

ATKINS

ACTIVE FAULTS
FIGURE 4.6.1

CARLSBAD SEWER, WATER, AND RECYCLED WATER
MASTER PLANS EIR

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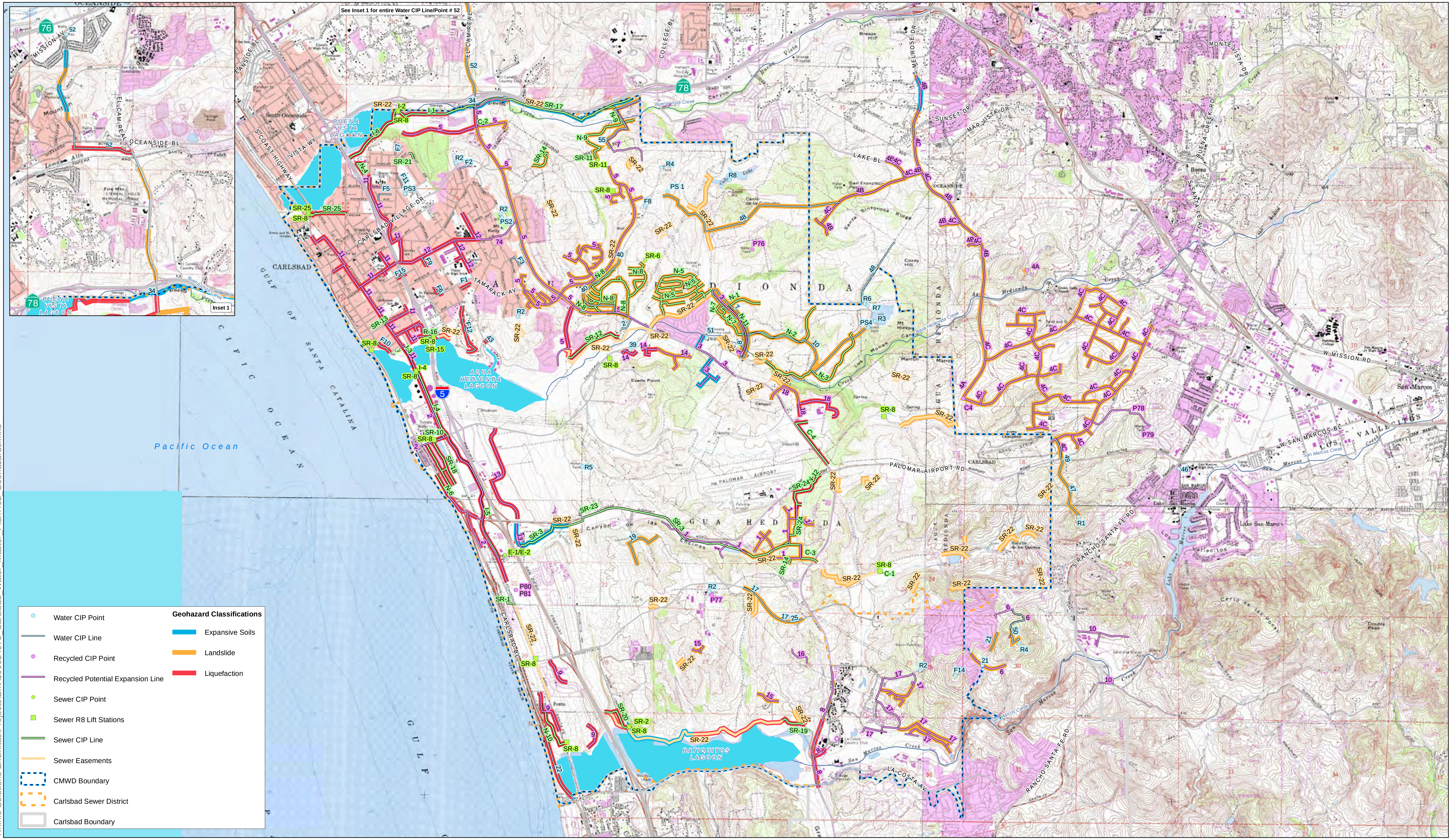

Source: Encinitas, Oceanside, Rancho Santa Fe, San Luis Ray, San Marcos 7.5' USGS Topographic Maps.

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Feet

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GEOHAZARDS
FIGURE 4.6-2

CARLSBAD SEWER, WATER & RECYCLED WATER MASTER PLANS EIR